Bank Customers Management System

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ABSTRACT

The purpose of this project is in partial fulfilment of the requirements of Bachelor of Science (Hon) in Information Technology. The Design and development of this Bank customers Management system provides a more secured approach in managing bank customer's information which strengthens the relationships between banks and their customers by providing the right solutions that uses a multi-level security to improve customer satisfaction.

The technology used in developing this project is ASP.NET, and the programming language used to develop this project is C# and the IDE used is Microsoft Visual Studio 2013 professional in designing the front end while the back end uses Microsoft SQL Server 2012.

Keywords : Microsoft SQL Server 2012, Microsoft Visual Studio 2013 professional

1 INTRODUCTION

1.1 Overview

Today, banks are looking beyond the transactions to the full opportunity on how to manage their customers. Accordingly, they are moving beyond managing clients as simple contacts to a whole new level of client relationship management, crafting a superior commercial client experience that gives the bank a competitive advantage and a more loyal, profitable and committed customers.

Internet Banking System refers to systems that enable bank customers to access accounts and general information on bank products and services through a personal computer or other intelligent device. But most of these systems do not focus on how best to manage and keep their customer's data more secured.

The chances and threats that the internet symbolizes is no longer news to the present day banking sector. No traditional bank would dare face investment analysts or new customers without an internet strategy. The main intention behind the commencement of electronic banking services is to provide the customers with an alternative that is more responsive and with less expensive options. With options more secured, customers have more control than ever. Their

expectations are how safe and secured their personal information would be. They also want personal attention and highly customized products and services.

This Bank Customer Management System (BCMS) aims to provide critical information for managing the bank customers more effectively, and encourages other banks that already have similar systems to move beyond transactions to better customer management approach.

Customer management is a broad concept that essentially covers the following: Understanding customer needs, matching customer needs to the best offers in terms of product, service and delivery channels, and effectively managing the critical moments during the customer life cycle.

Present experience shows that most of the banks in emerging markets are not fully managing their customers effectively due to lack of the necessary capabilities to manage these customer.

Better customer management has been shown to directly affect the profitability of banking institutions. No doubt that this Bank customer's management system would provide such bank with much better profits and other benefits.

However, financial services providers, who may find this application particularly helpful in expanding their operations and better tailoring their products and services, include commercial banks and other interested institutions in the financial services space would be more than satisfied and also provides a better customer satisfaction.

I was motivated to develop this Bank Customers Management System by various bank specific experiences I had with some banks, my current existing research on other bank systems, and interviews with users of such systems.

More importantly, this system is not designed to be prescriptive and does not advocate for a single approach to customer management in the banking sectors. Rather, to encourage financial services providers in making informed choices in the challenges, opportunities, and effective practices in providing a safe and secured customer management across the globe.

1.2 Problem Statement

At present most of the banking applications are yet to overcome the rapidly growing attacks on their customer private data. Issues suck fraud operating within a conventional environment. However current systems are still trying to cope with the existing institutional structure, which is really meant for usual banking system only and not managing their customer's information more effectively.

Lack of adequate security measure is making it really challenging to successfully transform the bank customers' management systems from where it is now to where it should be. This challenge still lingers.

1.3 Objectives

The objective of this project is develop a bank customer management system to the best satisfaction of the customer and for profit maximization to the Banks.

The objectives are:

1. To create a banking system that is easily via internet

2. Reduce the flow of human traffic and long queues at banks

3. Reduce the time wasted in going to banks to update personal details.

4. To develop a bank customer management system with a multi-level security measure that will restore the customers' confidence

1.4 Scope

The scope of this project is limited to some activities of the operations unit of a banking system which include opening of account, deposit of funds, withdrawal of funds, transfer of funds from one account to another and updating personal details.

This application does not focus on other online services such as; purchasing items online, bill payment loan application etc.

1.5 Justification of the Project

On a successful completion and implementation of this project, users/customers will be rest assured that no amount of online threat from hacker and other attackers can penetrate their account even when their password is compromised.

This application uses a multi-level security measure to ensure that customers' personal details and account information are safe.

1.6 Organization of the Report

➢ **Chapter 1** covers the overview, problem statement, objective, scope, Justification of the project, and the organization of the report as stated (**1.6 above**).

➢ **Chapter 2** deals with the literature review or system review which is based on the existing systems with comparison and the summary of those systems.

➢ **In chapter 3** is about the methodology, review the methodologies of system development, choose the methodology or framework, the system requirement analysis which is comprises the hardware requirement and software requirement in which this system will be developed.

➢ **Chapter 4** provides the system analysis, results and the discussions. The functional and non-functional requirement; the system architecture which is use case diagram, activity diagram, data flow or sequence diagram, entity relationship diagram and unit testing.

➢ **Chapter 5** will be conclusion; which includes the concluding remarks, contribution, limitation of the system, suggestion of the future work, and summary

> ➢ **CHAPTER 2**
> ➢ **LITERATURE REVIEW**
>
> ➢
> ➢ **2.1 Introduction**
> ➢ This project analyses and exposes the banking channels and service preferences of most bank management systems in Nigeria and examines the factors influencing the intention to adopt or to continue the use of the existing banking among both users and non-users of internet banking. It is shown that although the banking sector in Nigeria is advancing, but bank customer's management systems in Nigeria is yet to be properly utilized as a real added value tool to improve customer relationship and confidence and to attain cost advantages.
> ➢ Most banks throughout the world, ICT have become the back bone of financial service delivery and finance networks have shifted from paper-based to the digital mode. However, digital financial service delivery confronts a number of challenges regarding its efficacy in closing the "financial divide" affecting the poor. Although online banking is considered an inexpensive way to reach clients, its accessibility is hindered by a number of factors including poor Internet penetration, lack of e-banking awareness and customer inflexibility to new technology. In developing countries most

of which are characterized by extreme poverty and poor infrastructure, universal Internet-based service provision remains indefinable

> ➢ Also Data was collected from internet banking users and potential users in the Malaysia and most the respondents narrated their ordeals on how their bank account and personal information were compromised in the recent times. There is a significant difference between current users and intending users of the current system, where they are faced with the fear of insecurity on the current systems.
> ➢ More on customer perceptions regarding e-banking services. A survey of some respondents was conducted in February 2015 in Kuala Lumpur, Malaysia the respondents were divided among three bank groups namely, Public bank, May bank and CIMB bank. My survey investigates how these customers feel with the current customer management systems, but the perceptions of the bank customers regarding necessity, quality of e-banking services, bank frauds, and how these banks manage their data was not satisfactory.
> ➢ The major finding of this study is that customers of all bank groups are interested in e-banking services that provides a better customers management approach, but at the same time they are facing problems like, inadequate knowledge, poor network, lack of infrastructure, this Project frames some strategies like customer education, seminars/meetings, proper approach to manage

existing customers and create room for new customers. Majority of professionals and business class customers as well as highly educated customers also feel that e-banking has more to improve the quality of customer services in banks.

➢ **2.2 MayBank2u**

➢ MayBank2u home page and login page.
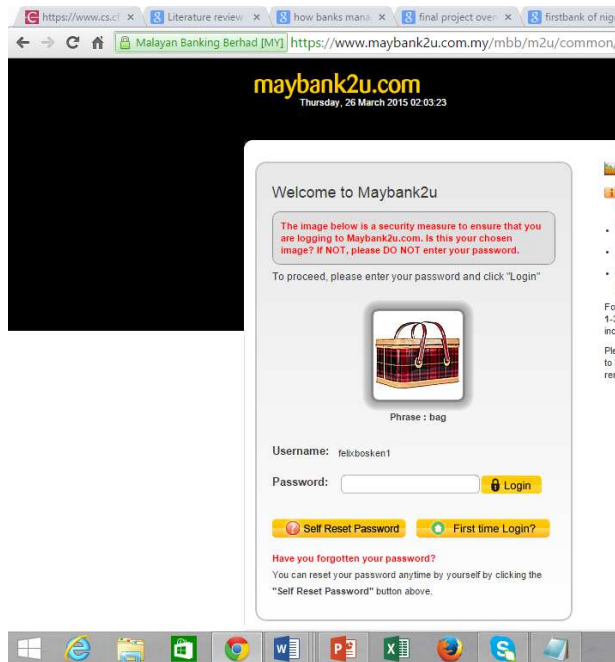
➢ Fig 1a Maybank2u.com.my

The above Manbank2u.com.my interfaces are the home page and log in pages and as such it focuses more on Cards, investment, insurance, loans, other services and private banking. It does not clearly provide a customer management approach where customers can update their existing personal details whenever they wish. However if a customer wants to update his or her personal details, that customer would be required to visit the nearest May bank. That will require time, money and energy to do that.

The log in interface only provides a pictorial view after the user inputs his/her user name followed by password. Anyone who has access to your username and password can easily access your account when provided with such login information and as such the account information can easily be compromised.
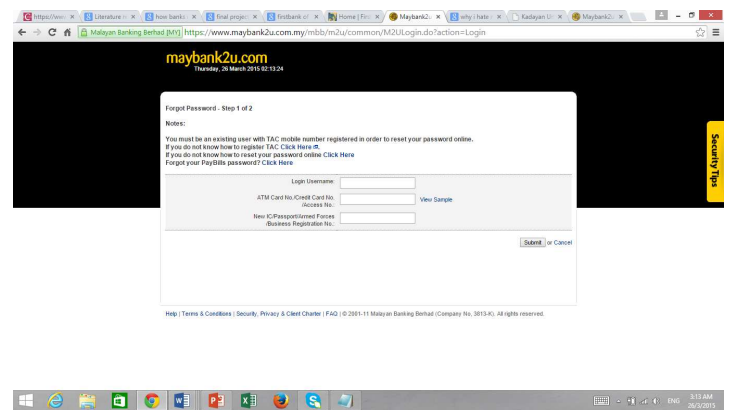

Fig 1b Maybank2u.com.my (forgot password)

How about the password reset as shown in fig. 2.2b? When a user wants to reset his/her password, the maybank2u does not effectively and immediately allows the users to reset their password at ease, rather the user has to fill in everything including ATM card number and National ID number before they send a reset code via SMS. What if the user loses his or her ID and ATM card? Then you will be required to make a police report and other necessary documentations before you can reset your password alone. This idea is basically not suitable for password reset and recovery. Before the user can gather all the required details his or

her account might have been dealt with. And as such, maybank2u.com.my does not effectively manage its customer. That is one of the reasons most people till today does not like using this application due to this weakness.

2.3 CIMBCLIICKS

CIMBCLICKS home page.

Fig 2a.Cimbclicks.com.my

The Cimbclicks.com.my works similarly to that of May Bank it focuses more on Clicks Shoppe, Cards, investment, insurance, loans, other services and private banking. It does not clearly provide a customer management approach where customers can update their existing personal details whenever they wish.

However if a customer wants to update his or her personal details, that customer would be required to visit the nearest May bank. That will require time, money and energy to do that
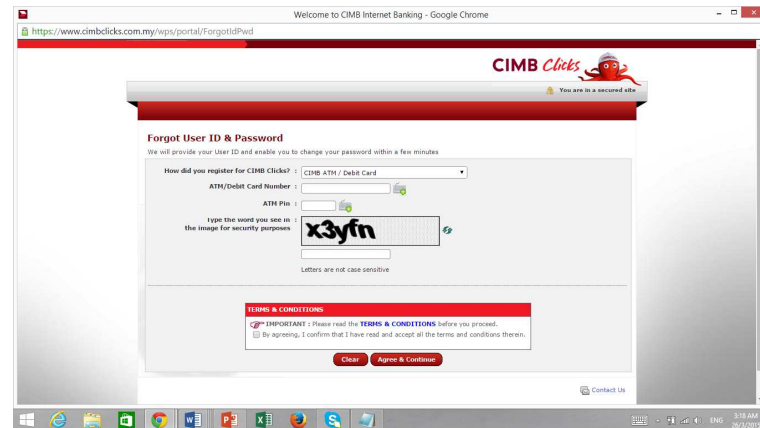

Fig 2b Cimbclicks.com.my (Forgot Password)

Also when a user wants to reset his/her password, the cimbclicks.com.my does not effectively and immediately allows the users to reset their password at ease, rather the user has to fill in everything including ATM card number, ATM pin and National ID number before the user can reset his password. What if the user loses his or her ID and ATM card? Then you will be required to make a police report and other necessary documentations before you can reset your password alone. This idea is basically not suitable for password reset and recovery. Before the user can gather all the required details his or her account might have been dealt with. And as such, cimbclicks.com.my does not effectively manage its customer. That is one of the reasons most people till today does not like using this application due to this weakness.

2.4 First Bank of Nigeria Plc

Fig 3 First Bank plc Nigeria

The First Bank of Nigeria application does not provide and form of customer management approach rather the application is full of advertisement and entertainment. Every customer is required to go to his/her branch to update their personal details.

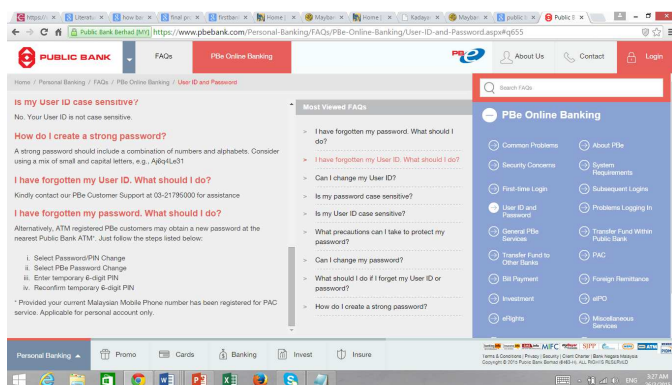## 2.4 Public Bank

Public Bank

Fig 4 Public Bank (forgot password)

When users want to reset their password, the Public bank application does not provide such management

services, rather the users are required to visit public bank office to do that.

Table 4: Summary of Literature review

This study provides a much better understanding the depth of bank customers' management systems. The above table shows a summary of some bank customer management systems that are currently used by various bank in Malaysia and in Nigeria. However, compared to the proposed system, most of them have common functionalities such as registration module, login, fund transfer etc.

This bank customer's management system (BCMS), as I propose after a successful implementation, there will a much better and reliable customer management

✓ This system will also send email alert to the receiving customer on the inflow of cash from another

System	Modules/Capabilities										
	Register	Login	SMS	Fund Transfer	Account info Request	Loan	TAC	Ease Password Reset	Email Notification	Multi-level Image security	Update personal info
Maybank2u	✓	✓	✓	✓	✓	✓		X	X	X	X
Cimbclicks	✓	✓	✓	✓	✓	✓		X	X	X	X
Public Bank System	✓	✓	✓	✓	✓	✓		X	X	X	X
First Bank of Nigeria System	✓	✓	✓	✓	✓	✓		X	X	X	X
BCMS	✓	✓	✓	✓	✓	X		✓	✓	✓	✓

; **2.5 Summary of Literature Review**

✓ The customers can conveniently change/reset their secured password without going to the bank to do that.
✓ This system will also allow customers and other users like the Bank mangers to update their personal information when necessary such as; home address, email, mobile number etc.
✓ This system will also send automatic email notification to the customer every time he/she makes a fund transfer.

✓ This bank customer's management system will also provide a much more secured multi-level image security to better manage customer's information and to prevent them from attacks or any unauthorized users.

CHAPTER 3

METHODOLOGY

3.1 Introduction

A software development methodology is a framework that is used to structure, plan, and control the process of developing an information system, this includes the pre-definition of specific deliverables and

artifacts that are created and completed by a project team to develop or maintain an application. A wide variety of such frameworks have evolved over the years, each with its own recognized strengths and weakness. One software development methodology framework is not necessarily suitable for use by all projects. Each of the available methodology frameworks are best suited to specific kinds of projects, based on various technical, organizational, project and team considerations. These software development frameworks are often bound to some kind of organization, which further develops, supports the use, and promotes the methodology framework. The methodology framework is often defined in some kind of formal documentation. Specific software development methodology frameworks include:

- ✓ Rational Unified Process (RUP, IBM) since 1998.
- ✓ Agile Unified Process (AUP) since 2005 by Scott Amber

Every software development methodology approach acts as a basis for applying specific frameworks to develop and maintain system. Several system development approaches have been used since the origin of information technology, broadly these are:

1. Software development life cycle methodology (SDLC), there are many models under these methodologies:

    - ✓ **Waterfall** which is a linear framework

- ✓ **Rapid application development** (RAD): an iterative framework
- ✓ **Spiral**: a combined linear-iterative framework
- ✓ **Incremental**: a combined linear-iterative framework or V model
- ✓ **Prototyping**: an iterative framework

2. Agile methodology:
    - ✓ Scrum
    - ✓ Extreme programming
    - ✓ Adaptive software development (ASD)
    - ✓ Dynamic system development method (DSDM)

3.2 Review on three Methodologies,

3.2.1 Waterfall model

The Waterfall Model was first Process Model to be introduced. It is also referred to as a linear-sequential life cycle model. It is very simple to understand and use. In a waterfall model, each phase must be completed fully before the next phase can begin. This type of model is basically used for the project which is small and there are no uncertain requirements. At the end of each phase, a review takes place to determine if the project is on the right path and whether or not to continue or discard the project. In this model the testing starts only after the development is complete. In waterfall model phases do not overlap.
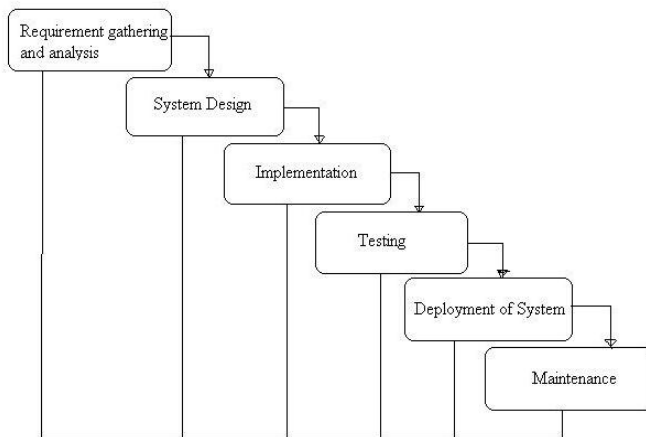
General Overview of Waterfall Model

Fig 5 Waterfall Model

Advantages of waterfall model:

✓ This model is simple and easy to understand and use.

✓ It is easy to manage due to the rigidity of the model – each phase has specific deliverables and a review process.

✓ In this model phases are processed and completed one at a time. Phases do not overlap.

✓ Waterfall model works well for smaller projects where requirements are very well understood.

Disadvantages of waterfall model:

✓ Once an application is in the testing stage, it is very difficult to go back and change something that was not well-thought out in the concept stage.

✓ No working software is produced until late during the life cycle.

✓ High amounts of risk and uncertainty.

✓ Not a good model for complex and object-oriented projects.

✓ Poor model for long and ongoing projects.

✓ Not suitable for the projects where requirements are at a moderate to high risk of changing.

When to use the waterfall model

✓ This model is used only when the requirements are very well known, clear and fixed.

✓ Product definition is stable.

✓ Technology is understood.

✓ There are no ambiguous requirements

✓ Ample resources with required expertise are available freely

✓ The project is short.

However, very less customer enter action is involved during the development of the product. Once the product is ready then only it can be demoed to the end users. Once the product is developed and if any failure occurs then the cost of fixing such issues are very high, because we need to update everywhere from document till the logic.

3.2.2 Incremental model

In incremental model the whole requirement is divided into various builds. Multiple development cycles take place here, making the life cycle a "multi-waterfall"

cycle. Cycles are divided up into smaller, more easily managed modules. Each module passes through the requirements, design, implementation and testing phases. A working version of software is produced during the first module, so you have working software early on during the software life cycle. Each subsequent release of the module adds function to the previous release. The process continues till the complete system is achieved.
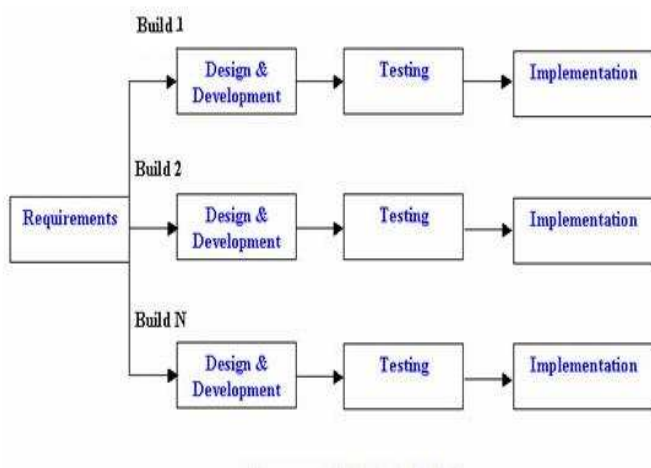

Fig 6. Incremental Life Cycle Model

Advantages of Incremental model

- ✓ Generates working software quickly and early during the software life cycle.
- ✓ This model is more flexible: less costly to change scope and requirements.
- ✓ It is easier to test and debug during a smaller iteration.
- ✓ In this model customer can respond to each built.

- ✓ Lowers initial delivery cost.
- ✓ Easier to manage risk because risky pieces are identified and handled during it'd iteration.

Disadvantages of Incremental model:

- ✓ Needs good planning and design.
- ✓ Needs a clear and complete definition of the whole system before it can be broken down and built incrementally.
- ✓ Total cost is higher than waterfall.

When to use the Incremental model:

- ✓ This model can be used when the requirements of the complete system are clearly defined and understood.
- ✓ Major requirements must be defined; however, some details can evolve with time.
- ✓ There is a need to get a product to the market early.
- ✓ A new technology is being used
- ✓ Resources with needed skill set are not available
- ✓ There are some high risk features and goals.

3.2.3 Rapid Application Development model (RAD)

This is the methodology used in developing this Bank Customers Management System (BCMS). Rapid Application Development model is a type of incremental model. In RAD model the components or functions are developed in parallel as if they were mini projects. The developments are time boxed, delivered and then assembled into a working prototype. This

can quickly give the customer something to see and use and to provide feedback regarding the delivery and their requirements.
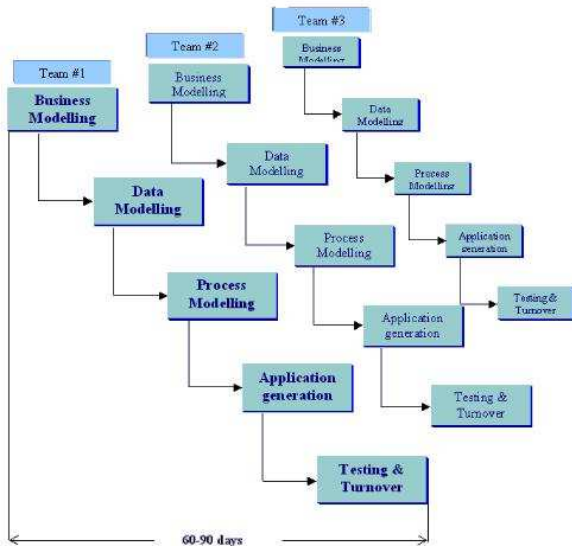
Diagram of RAD-Model

Fig 7 RAD Model

The phases in the rapid application development (RAD) model are

- ✓ **Business modeling**: The information flow is identified between various business functions.
- ✓ **Data modeling**: Information gathered from business modeling is used to define data objects that are needed for the business.
- ✓ **Process modeling**: Data objects defined in data modeling are converted to achieve the business information flow to achieve some specific business objective. Description are identified and created for CRUD (Create Retrieve Update Delete) of data objects.

- ✓ **Application generation**: Automated tools are used to convert process models into code and the actual system.
- ✓ **Testing and turnover**: Test new components and all the interfaces.

Advantages of the RAD model

- ✓ Reduced development time.
- ✓ Increases reusability of components
- ✓ Quick initial reviews occur
- ✓ Encourages customer feedback
- ✓ Integration from very beginning solves a lot of integration issues.

Disadvantages of RAD model

- ✓ Depends on strong team and individual performances for identifying business requirements.
- ✓ Only system that can be modularized can be built using RAD
- ✓ Requires highly skilled developers/designers.
- ✓ High dependency on modeling skills
- ✓ Inapplicable to cheaper projects as cost of modeling and automated code generation is very high.

Appropriate application of RAD model

- ✓ RAD should be used when there is a need to create a system that can be modularized in 2-3 months of time.

✓ It should be used if there's high availability of designers for modeling and the budget is high enough to afford their cost along with the cost

Features	Methodology		
	Waterfall Model	Incremental Model	RAD
Requirement Specification	Beginning	Beginning	Time boxed release
Cost	Low	Low	Low
Simplicity	Simple	Intermediate	Very simple
Risk involvement	High	Easily Manageable	Very Low
Expertise	High	High	Medium
Flexibility	Rigid	Less flexible	High
User involvement	Only at initial stage	Intermediate	At the beginning and also in real time development
Maintainability	Least	Promotes Maintainability	Easily Maintained
Development Time	Long	Very Long	Short

of automated code generating tools.

✓ RAD SDLC model should be chosen only if resources with high business knowledge are available and there is a need to produce the system in a short span of time (2-3 months).

3.3 Analysis Differentiate on Reviewed Methodologies

✓ Waterfall Model
✓ Incremental Model
✓ Rapid Application Development (RAD)

Having reviewed these methodologies, it is obvious that every software development follows a suitable development methodology and this is based on the requirement of the system. Furthermore, each of these methodologies has its advantages and disadvantages which states clearly on how best a system can be developed without much hitches based on the appropriate methodology used.

For waterfall model, once an application is in the testing stage, it is very difficult to go back and change something that was not well-thought out in the concept

submission length requirements, authors are strongly encouraged to make their appendices supplemental material.

stage, and to be used when the requirements are very well known, clear and fixed.

On the other hand, for Incremental Model, Its Total cost is higher than waterfall. And to be used when Resources with needed skill set are not available which does not fit in for this project. As per the focus of this Bank Customers Management system development, Rapid Application Development is the best methodology that suits this development and as such, this methodology

- ✓ Reduced development time.
- ✓ Increases reusability of components
- ✓ Quick initial reviews occur
- ✓ Encourages customer feedback
- ✓ Integration from very beginning solves a lot of integration issues.

This software BCMS is based on Rapid Application Development (RAD) Model. RAD model is an incremental software development process model that emphasizes an extremely short development cycle. If requirements are well understood and project scope is constrained, the RAD process enables a development team to create a "fully functional system" within short time periods (60-90 days).

And for this System development which falls within a short period of time, there is no other methodology suitable other than RAD, which is the best approach in producing the expected deliverable Bank Customer Management System (BCMS).

3.4 Justify Chosen Methodology

To solve actual problems in an industry setting, software engineer or a team of engineers must incorporate a development strategy that encompasses the process, methods and tools layers and generic phases. This strategy is often referred to as process model or a software engineering paradigm or project development approach.

A process model for software engineering is chosen based on the nature of the project and application, the methods and tools to be used, and the controls and deliverables that are required.

3.5 System Requirement Analysis

This includes the development environment and the operating system in which this Bank Customers Management system is build. The capacity of the client and servers and the type of

processors required in the hardware to develop this application ranging from front end to back end.

3.5.1 Hardware Requirement

Processor: Intel(R) Core

Installed Memory: 8.00GB

Speed: 1.70GHz or faster

Operating System: 64-Bit Operating system, x64-based processor

3.5.2 Software Requirement

Operating System: Windows 8.1

Data Base: Microsoft SQL Server -2012

Web Server: IIS (Internet Information Services)

Web Technologies: HTML, CSS, Ajax, Asp. Net with C#.NET

Client Application: Internet Explorer, chrome, Mozilla Firefox etc

IDE & Tools: Microsoft Visual Studio Ultimate-2012

CHAPTER 4

SYSTEM ANALYSIS, RESULT AND DISCUSSION

4.1 Introduction

A system requirements analysis is a complete description of the behavior of the system to be developed. It includes a set of use cases that describe all of the interactions that the users will have with the system. In addition to use cases, the system requirement analysis contains functional requirements, which define the internal workings of the system: that is, the calculations, technical details, data manipulation and processing, and other specific functionality that shows how the use cases are to be satisfied. It also contains nonfunctional requirements, which impose constraints on the design or implementation (such as performance requirements, quality standards or design constraints).

4.2 Requirement

The requirement is a complete description of the behavior of the system to be developed. These requirements includes: functional and non-functional requirements.

4.2.1 Functional Requirement

A functional requirement defines the internal workings of the system: that is, the calculations, technical details, data manipulation and processing, and other specific functionality that shows how the use cases are to be satisfied. The functionalities of

the system or modules are mean what the system supposes to do.

For admin Module

1. This system allows the admin to login with username and password

2. This system allows the admin to add a Bank branch details

3. This system allows the admin to accept or reject a manager/customer

5. This system allows the admin to approve or reject customer transaction request

5. This system allows the admin to View Managers & Customers details

For Manager Module

1. This system allows the manager to register

2. This system allows the manager to login with email and password

3. This system allows the manager to accept/reject branch customers

4. This system allows the manager to view customer transactions

5. This system allows the manager to update personal information

6. This system allows the manager to reset password if password is forgotten

7. This system allows the manager to Register New Customer

For Customer Module

1. This system allows the customer to login with email and password

2. This system allows the customer to update personal details

3 This system allows the customer to reset password if password is forgotten

4. This system allows the customer to view his/her account balance

5. This system allows the customer to transfer money from his account to another account

6. This system allows the customer to recover password

7. This system allows the customer to change password

8. This system allows the customer to delete profile

9. This system allows the customer to choose image point.

4.2.2   Non-Functional Requirement

Non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors. It is about how the system supposes to be and specify the quality of the system, is mostly related to the **satisfaction** of the user, example minimum acceptable page load time. Some of these non-functional requirements are:

1. Integrity

2. Usability

3. Maintainability

Integrity: Integrity testing is basically a type of software testing that is done to check whether the application or the product is secured or not. It checks to see if this application is vulnerable to attacks, if anyone hack the system or login to the application without any authorization.

It is a process to determine that an information system protects data and maintains functionality as intended. The security testing is performed to check whether there is any information leakage in the sense by encrypting the application or using wide range of software's and hardware's and firewall etc.

For example this online bank application can allow the users to login and carry out transaction but not to edit their account balance. As only when a transaction occurs their account balance should be automatically update

Usability: This has to do with black box testing, but relating it to white box testing, usability testing is a very wide area of testing and it needs fairly high level of

understanding of this field along with creative mind. People involved in the usability testing are required to possess skills like patience, ability to listen to the suggestions, openness to welcome any idea, and the most important of them all is that they should have good observation skills to spot and fix the issues or problems.

As soon as the user problems are identified, if such problem arises from the internal mechanism of the product then white box testing strategy can help to identify and fix those problems.

Maintainability: It basically defines that how easy it is to maintain the system. This means that how easy it is to analyses, change and test the application or product.

Maintainability testing shall use a model of the maintainability requirements of the software product. The maintainability testing shall be specified in terms of the effort required to effect a change under each of the following four categories:

1. Corrective maintenance: Deals with correcting problems. The maintainability of a system can be measured in terms of the time taken to diagnose and fix problems identified within that system.

2. Perfective maintenance: This deals with system enhancements. The maintainability of a system can also be measured in terms of the effort taken to make required enhancements to that system. This can be tested by recording the time taken to achieve a new piece of identifiable functionality such as a change to the database, etc. A number of similar tests should be run and

an average time calculated. The outcome will be that it is possible to give an average effort required to implement specified functionality. This can be compared against a target effort and an assessment made as to whether requirements are met.

3. Adaptive maintenance: Adapting to changes in environment. The maintainability of a system can also be measured in terms on the effort required to make required adaptations to that system. This can be measured in the way described above for perfective maintainability testing.

4. Preventive maintenance: Actions to reduce future maintenance costs. This refers to actions to reduce future maintenance costs and to maximize profit while reducing cost.

It also important to note that maintainability deals with; modular structure of software, internal program documentation, Programmers manual typical requirements, Code to company standards and guidelines.

4.3 System Architecture

4.3.1 Use case Diagram

Fig 8. Use Case Diagram

4.3.2 Activity Diagram
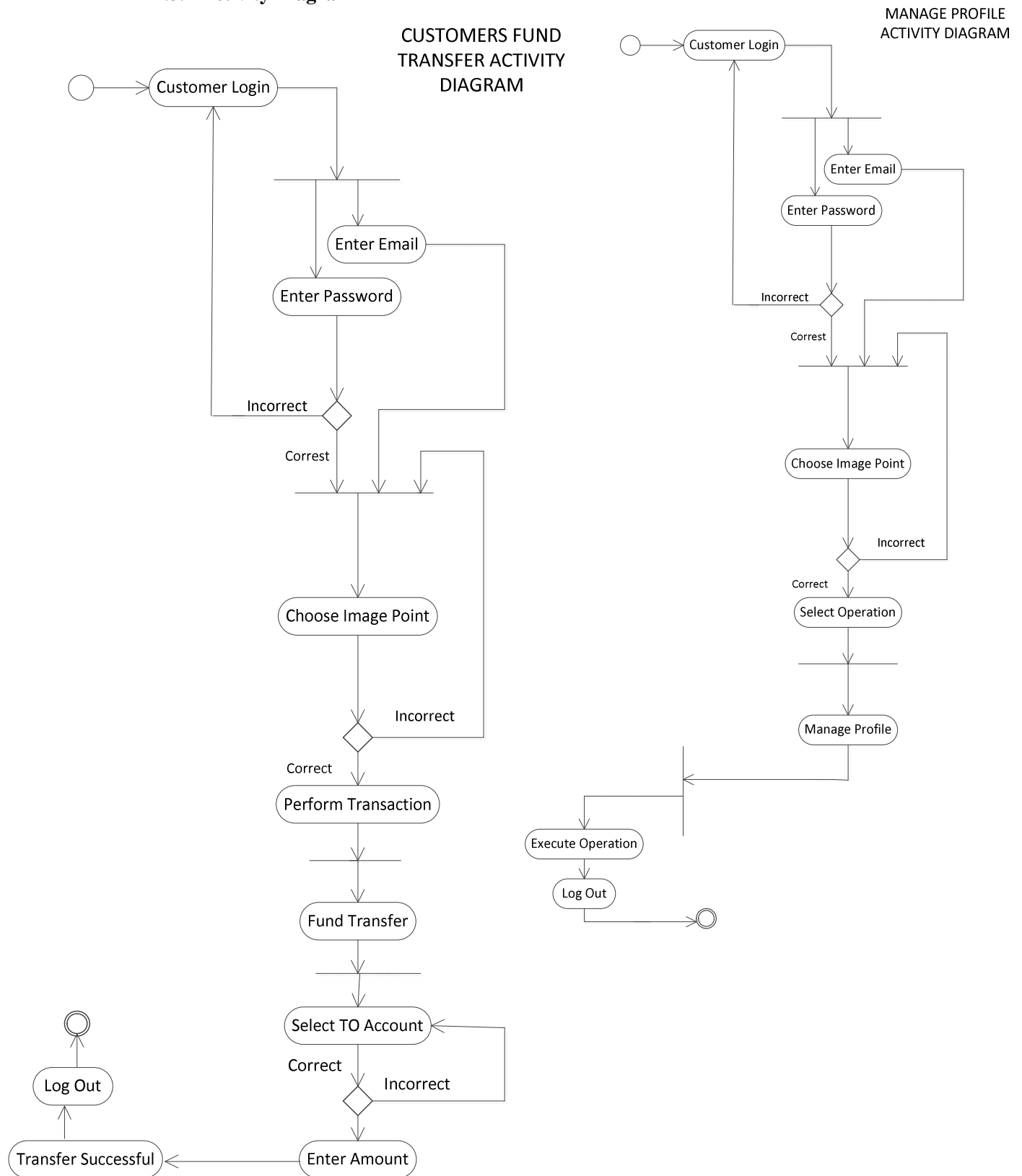
Fig 9. Customer Fund Transfer Activity Diagram

Bank Customers Management System

VIEW ACCOUNT ACTIVITY
DIAGRAM
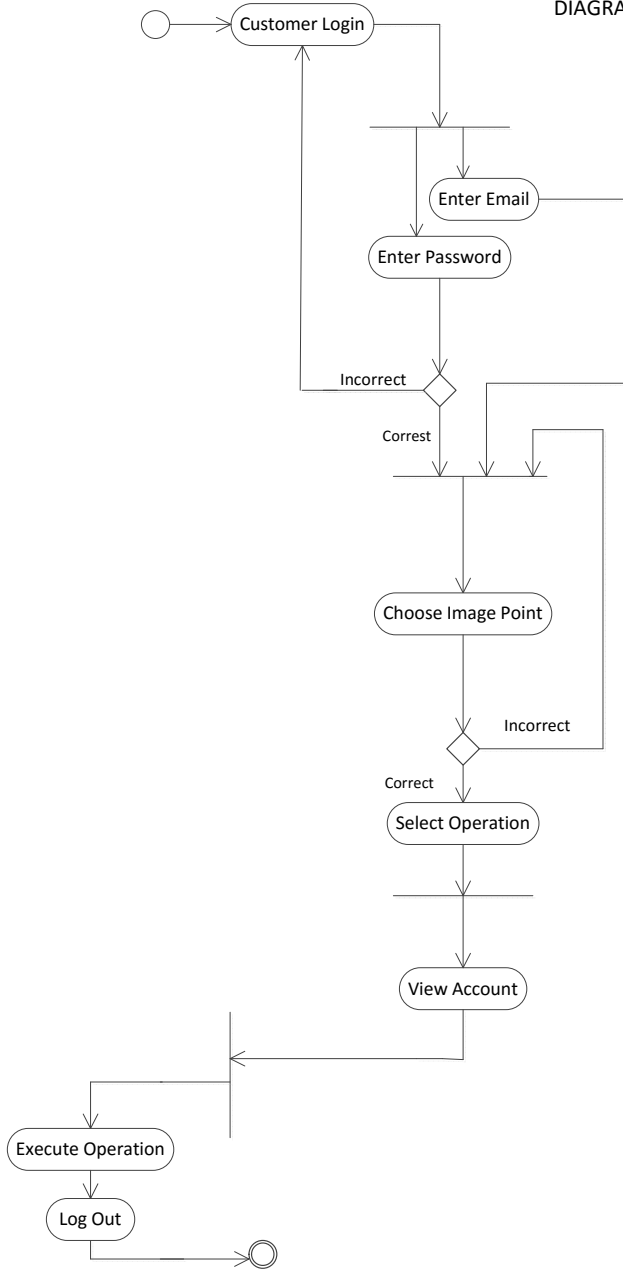
CHANGE PASSWORD
ACTIVITY DIAGRAM

Customer Login

Enter Email

Enter Password

Incorrect

Correst

Choose Image Point

Incorrect

Correct

Select Operation

View Account

Execute Operation

Log Out

Customer Login

Enter Email

Enter Password

Incorrect

Correst

Choose Image Point

Incorrect

Correct

Select Operation

Change Password

Execute Operation

Log Out

Bank Customers Management System

ManageProfile

SystemCustodian

Customer

EnterEmailAddress

RequestPassword

EnterPassword

ValidatePasswordRequest

Proceed

PassWordSucessful

ViewAccount

SystemCustodian

Customer

EnterEmailAddress

RequestPassword

EnterPassword

ValidatePasswordRequest

Proceed

PassWordSucessful

ChooseImagePoint

SelectImagePoint()

VerifyImagePoint

ImagePointSuccesful

ViewAccount()

PerformTranction

ERD

BranchTransCode

BankCriteria

BranchID

BRANCH

BranchName

Manager

BranchAddress

BranchPhoneNumber

HAS

HAS

ManagerID

FirstName

LastName

Gender

DateOfBirth

BranchID

Address

BankCriteria

BranchName

MobieNumber

EmailAddress

Password

MANAGER

APPROVES

CUSTOMER

CustomerID

FirstName

LastName

Gender

DateOfBirth

Address

MobileNumber

EmailAddress

PassWord

BranchID

CREDITS

CREATES

AccountNumber

BranchID

BankCriteria

ACCOUNT

AccountID

CustomerID

Fig 16. Entity Relationship Diagram (ERD)

MANAGE PROFILE SEQUENCE DIAGRAM
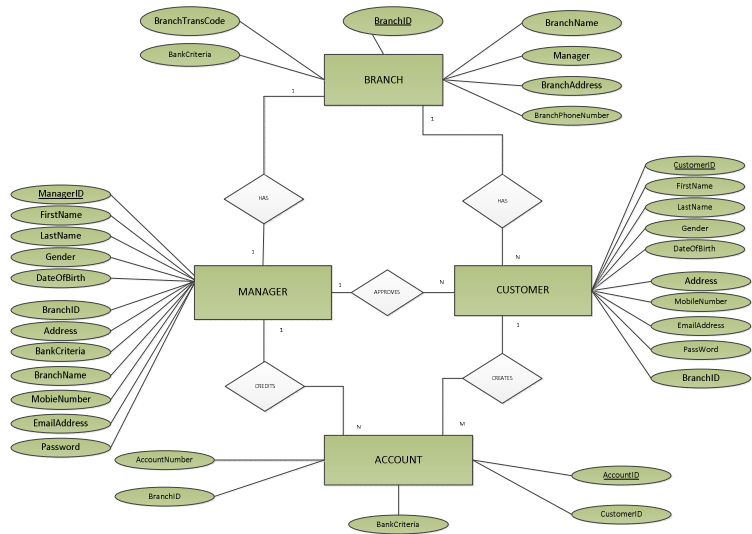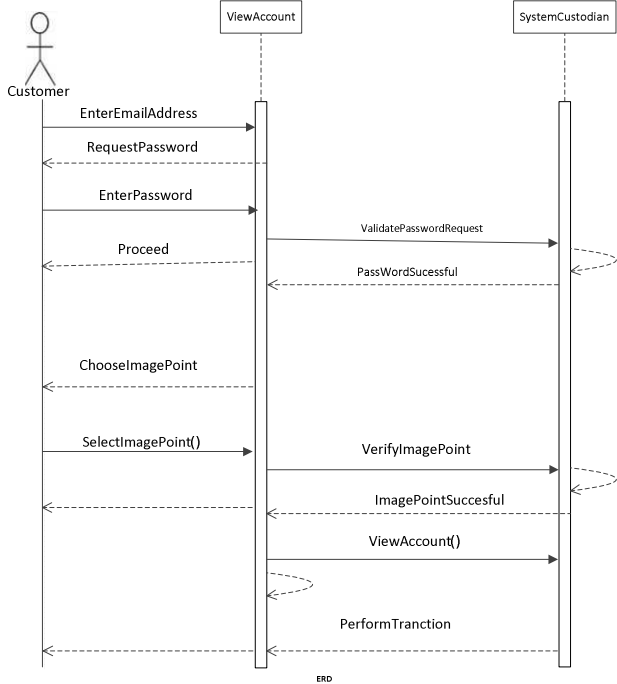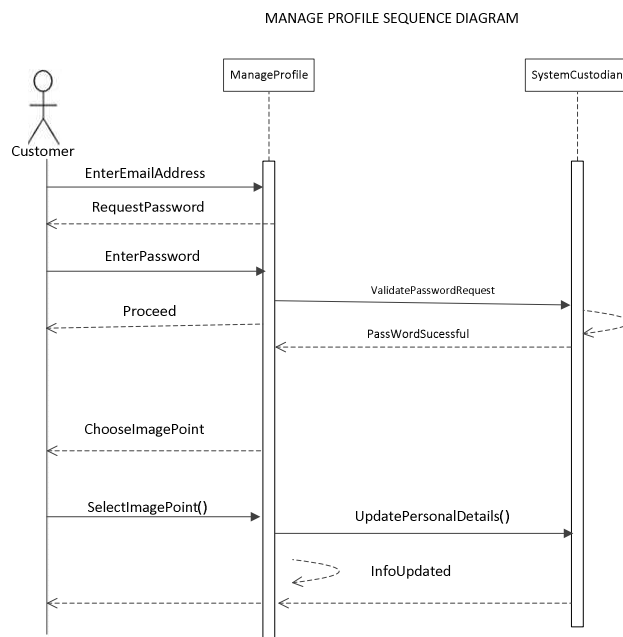

1.3

Unit Testing

A unit involves the smallest testable part of software. It usually has one or a few inputs and usually a single output

White box testing strategy: This is a testing strategy developers takes into account the internal mechanism of a system, application or component to check if the source code is working as expected or not . The white box testing strategy incorporate coverage of the code written, branches, paths, statements and internal logic of the code, etc. However, in order to implement white box testing strategy, the tester has to deal with the code, and hence is required to possess knowledge of coding and logic i.e., internal working of the code. It also called structural testing, glass box testing or clear box testing.

For example; when a developer develops an application (like this Bank customer management system), the developer first of all tests all the components by examining each line of code and also integrates all the components together and test them to check if the system has any error, during the implementation stage if there is any error the developer must start all over again by checking and tracing the cause of the error.

Black box testing strategy: Is a testing strategy in which the functionality of the software is tested without any reference to the internal design, code, or algorithm used in the program. Black box testing strategy ignores the internal mechanism of a system or component and focuses solely on the outputs generated in response to selected inputs and execution conditions. A testing strategy without having any knowledge of the internal workings of the application is Black Box testing strategy. The tester is oblivious to the system architecture and does not have access to the source code. Typically, when performing a black box test, a tester will interact with the system's user interface by providing inputs and examining outputs without knowing how and where the inputs are worked upon. Is also called functional testing.

For Example; when an aircraft crashes, the black box is recovered and test is being conducted on the black box, which contains the flight data recorder and cockpit voice recorder of a plane. The flight-data acquisition unit takes

the information from the sensors and sends it on to the black boxes. This is the key to uncovering what happened in an air crash. However, the black box testing is typically based on the output.

CHAPTER 5

CONCLUSION

5.1 Concluding Remarks

I have successfully designed, develop and implemented this Bank customers Management system which provides a more secured approach in managing bank customer's information and strengthens the relationships between banks and their customers by providing the right solutions that uses a multi-level security to improve customer satisfaction. I therefore encourages other developers of similar application to think twice on how best they can improve in developing a more secured system that will meet the challenges we face today especially on the banking sector and other financial institutions.

5.2 CONTRIBUTIONS

Advantages of White box testing strategy

1. Having the knowledge of the source code is beneficial to thorough testing.

2. Optimization of code by revealing hidden errors and being able to remove these possible defects.

3. Give the programmers deep thought, because developers carefully describe any new implementation.

4. Provides traceability of tests from the source, allowing future changes to the software to be easily captured in changes to the tests.

5. White box tests are easy to automate.

6. It helps in removing the extra lines of code, which can introduce defects in the code

7. As the knowledge of internal coding structure is prerequisite, it becomes very easy to find out which type of input/data can help in testing the application effectively.

8. Forces test developer to reason carefully about implementation

Advantages of Black Box Testing strategy

1. Tester needs no knowledge of implementation, including specific programming languages, i.e. tester can be non-technical.

2. Black Box Testing is used to verify contradictions in actual system and the specifications.

3. Test cases can be designed as soon as the functional specifications are complete.

4. The environment the program is running is also tested

5. Black Box Testing is efficient when used on larger systems

5.3. Limitations of the System:

This system does not support online purchases, bill payment and Loan services for now.

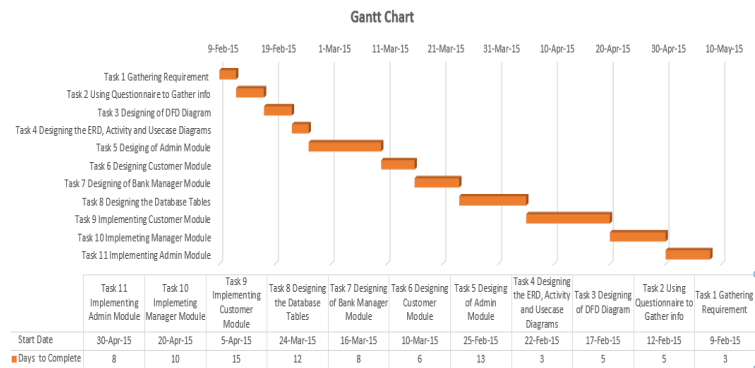## 5.4 Suggestions on Future work

In the future, online purchases, bill payment and Loan services can be incorporated into the system to enable the customers make purchase online and also pay bills.

5.5 SUMMARY

The world is changing at a staggering rate and technology is considered to be the key driver for these changes around us. Many activities are handled electronically due to the acceptance of information technology at home as well as at workplace. Slowly but steadily, Banks around the world is moving towards the internet banking.

No one wants to lose his/her money but there are several cases where peoples bank account, personal information are being compromised due to lack of adequate security in their online banking systems. E-banking or Online banking is generic term for the delivery of banking services and products through the electronic channels such as the internet, the cell phone etc. The concept and scope of e-banking is still evolving and customers protection should be prioritize.

It is imperative to note that This Bank customers Management System (BCMS) provides a high level security measure for effective customer management.

Appendix A-Gantt chart

Gantt Chart

	Task 11 Implementing Admin Module	Task 10 Implementing Manager Module	Task 9 Implementing Customer Module	Task 8 Designing the Database Tables	Task 7 Designing of Bank Manager Module	Task 6 Designing Customer Module	Task 5 Desiging of Admin Module	Task 4 Designing the ERD, Activity and Usecase Diagrams	Task 3 Designing of DFD Diagram	Task 2 Using Questionnaire to Gather info	Task 1 Gathering Requirement
Start Date	30-Apr-15	20-Apr-15	5-Apr-15	24-Mar-15	16-Mar-15	10-Mar-15	25-Feb-15	22-Feb-15	17-Feb-15	12-Feb-15	9-Feb-15
■ Days to Complete	8	10	15	12	8	6	13	3	5	5	3

Appendix B-Proposal Form

KUALA LUMPUR METROPOLITAN UNIVERSITY COLLEGE

FACULTY OF ENGINEERING AND INFORMATION TECHNOLOGY

SCHOOL OF INFORMATION TECHNOLOGY

**Faculty of Engineering and Informa
Technology
School of Information Technology
School of Networking
Project Proposal Form**

Kuala Lumpur Metropolitan
University College

School (Please Tick)	:	IT		Ne
LEVEL (Please Tick)	:	Degree		D
		Degree (CCSS)		
Proposed by (Name, Student Id, IC or Passport Number, Email and Mobile Phone Number)	:	EBUBEOGU AMARACHUKWU		
		A02535760		
		01-201210-00010		
		0111-6245233		

PROJECT TITLE (Please type below the proposed project title)

BANK CUSTOMERS MANAGEMENT SYSTEM

ABSTRACT (Please type below the abstract of the proposed project title. The abstract should cover clearly the project)

This application will help bank and its customers their data. This application uses an image to authen customer login credentials.

EXPECTED OUTCOMES (List the expected goals or outcomes to be achieved on successful completion of th

1. Customers can create account online
2. Customer can login using their login cred
3. This application allows only the admin to app
4. Customers must use image authentication in u
5. Customer can perform transaction using this a
6. Email and SMS notification will be sent to on a successful transition made.

Evaluation Outcome: (Groups of lecturers are required to vet the proposed title and to approve)

Supervisor Comment				
Recommendation	Recommended ✓	KIV		
Supervisor Name	Mr Mahendran	Sign		D
Examiner Comment				
Recommendation	Recommended ✓	KIV		
Examiner Name	Miss Nur Amira	Sign		D

Coordinator Comment				
	Approved ✓	KIV		
Coordinator Name	Miss Azizah Abdollah	Sign		D

Azizah Abdollah
Lecturer
Kuala Lumpur Metropolitan College

**PROJECT
LOG BOOK**

Name of Student: EBUBEOGU AMARACHUKWU FELIX

Students ID: 01-201210-00010

IC/Passport Number: A05771455

Telephone: 0111-624-5233

Email: felixboston@gmail.com

Programme: BSIT

Project Title: Bank Customers Management System

Supervisor: Mr. Mahendran

Appendix C-Log Book

Felix

SUMMARY OF PROJECT DEVELOPMENT

Student must **submit** this page everytime they come and see their s

Week: .....1.....................

Project Achievement:

☐ Introduction and Literature Review   ☐ Methodology   ☐ Result

Move to week:.............. (If necessary)

Final Project Progress	Supervisor Comment	Next M
Started Requirement Gathering phase) Bench Marked the following) "Bank Customers Management System" I have Collected design and the functional requirement that are necessary.	More rhb analysis part to segregate the necessary attributes from the unnecessary attributes.	17/02/ Systems "Bank System" Identif requirer should

Supervisor: _____ Date: 9/2/15

Project Co-ordinator: _____ Date: 9/3/15

Felix

SUMMARY OF PROJECT DEVELOPMENT   Date:...........................

Student must **submit** this page everytime they come and see their supervisor

Week: .....2.............

Project Achievement:

☐ Introduction and Literature Review   ☐ Methodology   ☐ Result   ☐ Conclusion

Move to week:.............. (If necessary)

Final Project Progress	Supervisor Comment	Next Meeting (Target to achieve)
Using simple Questionnaire to gather information on users Opinion about the current system provided by their Banks respectively	mas on to desgng to ERD, DFF etc	23/02/15 Identify and capture stakeholders requirement using interviews and Surveys.

Supervisor: _____ Date: 17/2/15

Project Co-ordinator: _____ Date: 9/3/15

Head of School: _____ Date: 4/3/15

SUMMARY OF PROJECT DEVELOPMENT

Student must **submit** this page everytime they come and see their s

Week: ....3....

Project Achievement:

☐ Introduction and Literature Review   ☐ Methodology   ☐ Result

Move to week:............ (If necessary)

Final Project Progress	Supervisor Comment	Next
Designing the Data flow Diagram ∆FD Level 0 (System Level ∆FD)	Good Keep it up	02/03/

Supervisor: ____   Project Co-ordinator: ____
Date: 10/2/15   Date: 10/3/15

Felix   Date: 10/3/15

SUMMARY OF PROJECT DEVELOPMENT

Student must **submit** this page everytime they come and see their supervisor

Week: ....4....

Project Achievement:

☐ Introduction and Literature Review   ☐ Methodology   ☐ Result   ☐ Conclusion

Move to week:............ (If necessary)

Final Project Progress	Supervisor Comment	Next Meeting (Target to achieve)
Designing the ERD, Activity Diagram, Use Case Diagram Sequence Diagram	Good Keep up. Nice!	

Supervisor: ____   Project Co-ordinator: ____   Head of School: ____
Date: 20/2/15   Date: 10/3/15   Date: 11/3/15

SUMMARY OF PROJECT DEVELOPMENT

Student must **submit** this page everytime they come and see their su

Week: ....5..........

Project Achievement:

☐ Introduction and Literature Review   ☐ Methodology   ☐ Result

Move to week:............. (If necessary)

Final Project Progress	Supervisor Comment	Next M
Designing the Admin Module ⓐ Admin login·aspx ⓑ Admin Manage Bank Managers·aspx ⓒ Admin Manages All Customers·aspx ⓓ Admin Manage Bank Criteria·aspx ⓔ Admin Manages Fund Transfer·aspx·	Do Unit Test	Design Module

Supervisor: _____

Date: 23/3/15

Project Co-ordinator: _____

Date: 23/3/15

Felix

SUMMARY OF PROJECT DEVELOPMENT

Date:...........................

Student must **submit** this page everytime they come and see their supervisor

Week: ....6..........

Project Achievement:

☐ Introduction and Literature Review   ☐ Methodology   ☐ Result   ☐ Conclusion

Move to week:............. (If necessary)

Final Project Progress	Supervisor Comment	Next Meeting (Target to achieve)
Designing the Customer Module ⓐ Customer Registration·aspx ⓑ Customer login·aspx ⓒ Customer Edit Profile·aspx ⓓ Customer Profile·aspx ⓔ Customer Image Registration·aspx ⓕ Customer Image login·aspx ⓖ Customer change Password·aspx ⓗ Customer Fund Transfer·aspx ⓘ Customer Confirm Tranfer·aspx	Go on with Unit Testing	

Supervisor: _____   Project Co-ordinator: _____   Head of School: _____

Date: 23/3/15   Date: 23/3/15   Date: 28/4/15

SUMMARY OF PROJECT DEVELOPMENT

Student must **submit** this page everytime they come and see their su

Week: ......7.................

Project Achievement:

☐ Introduction and Literature Review ☐ Methodology ☐ Result

Move to week:.............. (If necessary)

Final Project Progress	Supervisor Comment	Next M
Designing the Bank Manager Module ⓐ ManagerRegistration - aspx ⓑ Manager.Login.aspx ⓒ Manager Profile aspx ⓓ EditProfile - aspx ⓔ Change Password - aspx ⓕ ForgotPassword. aspx	Start Testing plan on individual module	Desig

Supervisor: _____ Project Co-ordinator: _____

Date: 27/7/15 Date: 23/3/15

SUMMARY OF PROJECT DEVELOPMENT

Felix

Date:.............................

Student must **submit** this page everytime they come and see their supervisor

Week: ......8.........

Project Achievement:

☐ Introduction and Literature Review ☐ Methodology ☐ Result ☐ Conclusion

Move to week:.............. (If necessary)

Final Project Progress	Supervisor Comment	Next Meeting (Target to achieve)
Database Design using SQL Server 2012 ⓐ Bank Branch Table ⓑ Customer Table ⓒ Manager Table ⓓ Customer Account Table	Start Testing plan	

Supervisor: _____ Project Co-ordinator: _____ Head of School: _____

Date: 23/3/15 Date: 23/3/15 Date: 28/4/15

FELIX

SUMMARY OF PROJECT DEVELOPMENT

Student must **submit** this page everytime they come and see their

Week: ....9.............

Project Achievement:

☐ Introduction and Literature Review   ☐ Methodology   ☐ Result

Move to week:............. (If necessary)

Final Project Progress	Supervisor Comment	Next I
Implementation of Customer Module. - Customer Registe -aspt-cs - customer Login - apt-cs - Customer Profile - aspt-cs - Customer Fund Transfer - aspt-cs - customer change eficsolded - aspt-cs - customer msg - aspt-cs - TAC Confirm - aspx-cs - Reset Passwlad - aspx-cs	go chod	

Supervisor: _____   Project Co-ordinator: _____

Date: 26/c/15   Date: 27/4/15

SUMMARY OF PROJECT DEVELOPMENT   Date:.............................

Student must **submit** this page everytime they come and see their supervisor

Week: ....10...........

Project Achievement:

☐ Introduction and Literature Review   ☐ Methodology   ☐ Result   ☐ Conclusion

Move to week:............. (If necessary)

Final Project Progress	Supervisor Comment	Next Meeting (Target to achieve)
Implementation of Manager Module - Manager Login - aspx-cs - Manage Profile - aspx-cs - Manage Registe - aspx-cs - Edit Manager Profile - aspx-cs - Manage Change Password - aspx-cs	go chod	Testing

Supervisor: _____   Project Co-ordinator: _____   Head of School: _____

Date: 26/4/15   Date: 27/4/15   Date: 28/4/15

SUMMARY OF PROJECT DEVELOPMENT

Student must **submit** this page everytime they come and see their su

Week: .... 11 ....

Project Achievement:

☐ Introduction and Literature Review   ☐ Methodology   ☐ Result

Move to week:.............. (If necessary)

Final Project Progress	Supervisor Comment	Next M
Implementation of Admin Module — Admin login - aspt. cs — Admin Mange AllCustom - aspt . cs — AdminManage Bank Manager - aspt . cs AdminMenage Fund Trans - aspt - cs	go ahead)	

Supervisor: _____   Project Co-ordinator: _____

Date: _____   Date: __27/4/15___

Appendix D-Questionnaire

BANK CUTOMERS MANAGEMENT SYSTEM

<u>Questionnaire</u>

Name: --------------------------
Age: -------------------------
Contact No.   -------------------------
Bank Name: -------------------------

1. Since how long you have been using online banking system?

        0-5

        5-10

        10-15

        More than 15 years

2. Are you satisfied with the services?

    Yes

    No

3. Are you satisfied with the system security?

    Yes

    No

4. Has the Bank called you before while performing online transaction?

        Yes

        No

Appendix E-Interfaces
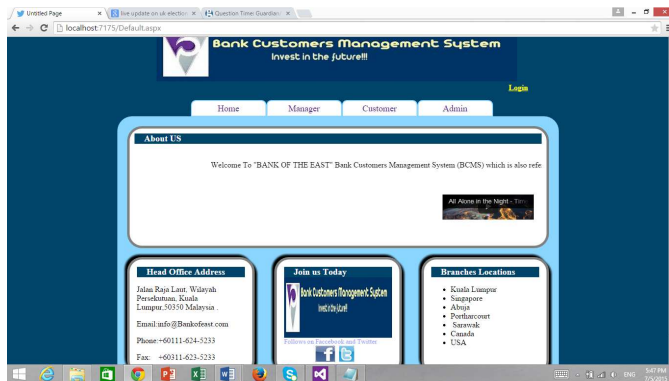
Fig 17.HomePage
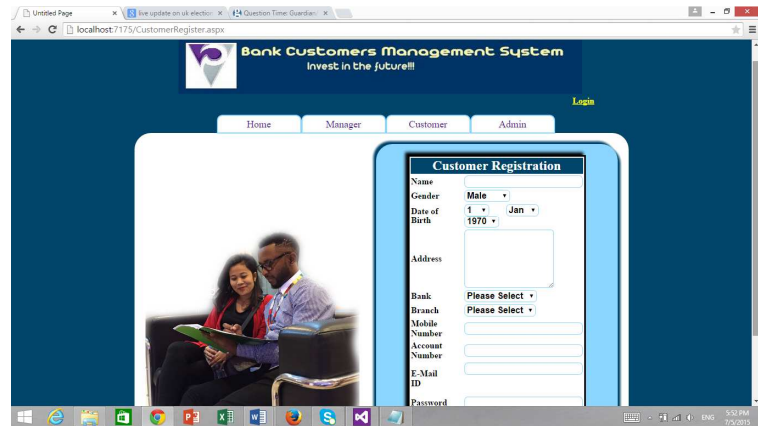
Fig 20. New Customer Registration Page
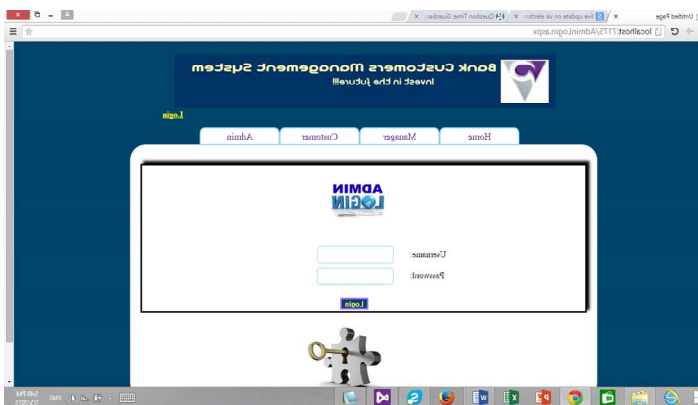
Fig 18. Admin Login Page
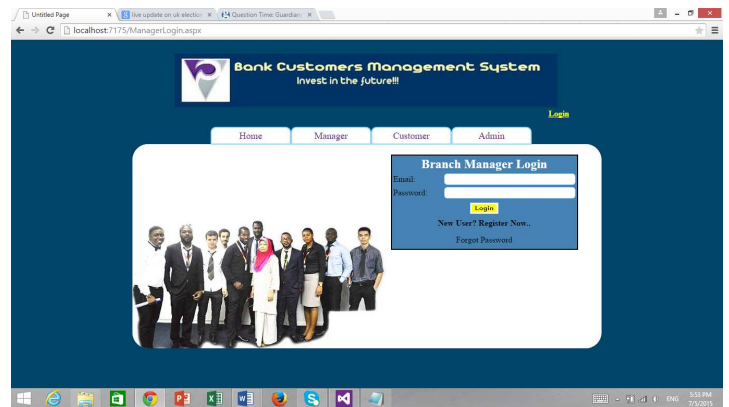
Fig 21. Manager Login Page
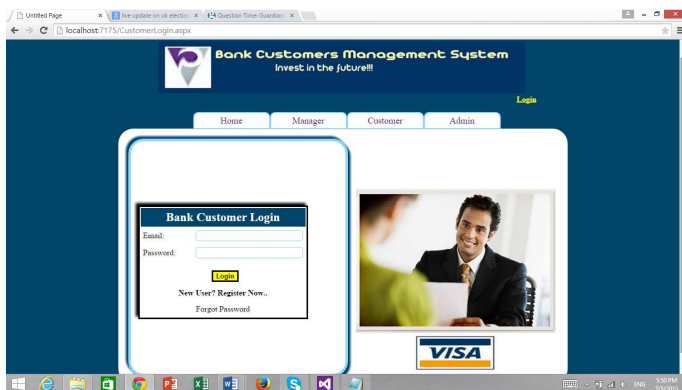
Fig19. Bank Customer Login Page
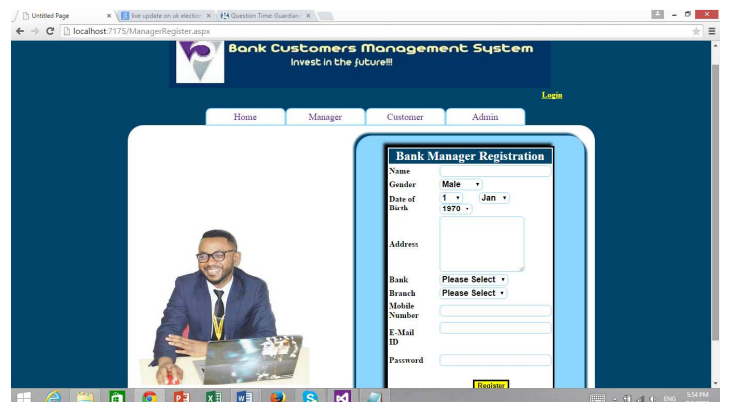
Fig.22. New Manager Registration Page
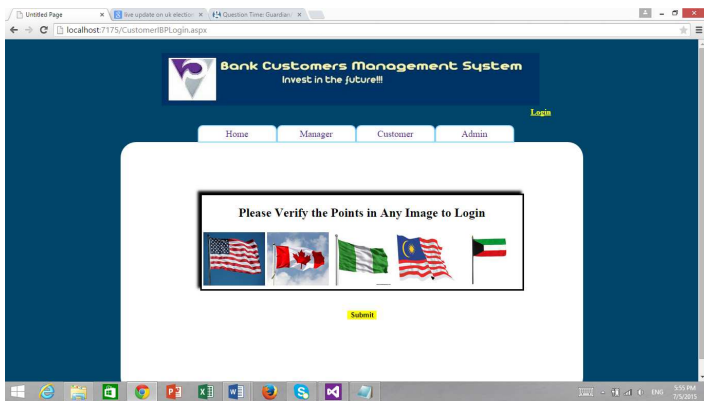
Fig 23. Image Verification Page
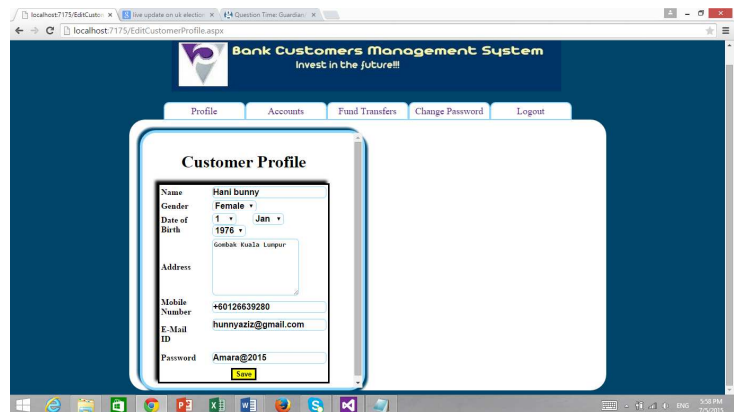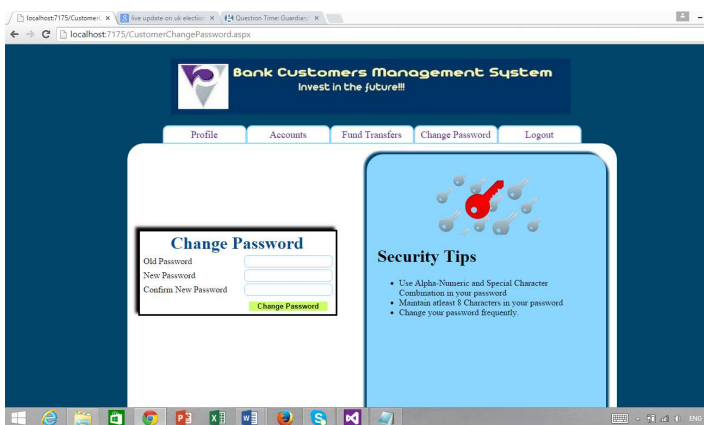

Fig 26. Edit Customer Profile Page
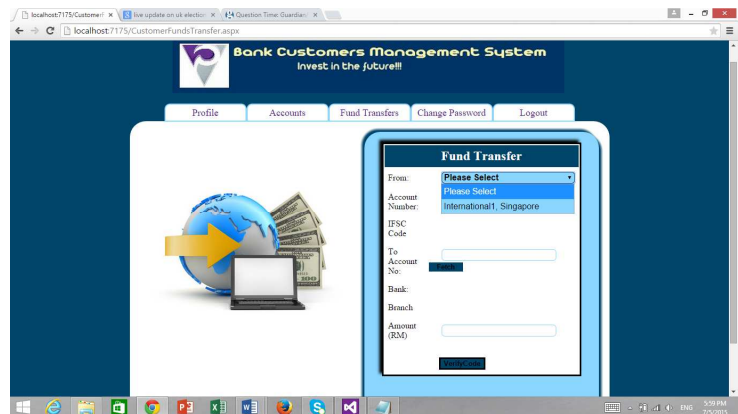

Fig 24. Customer Change Password Page

Fig 27. Customer Fund Transfer Page
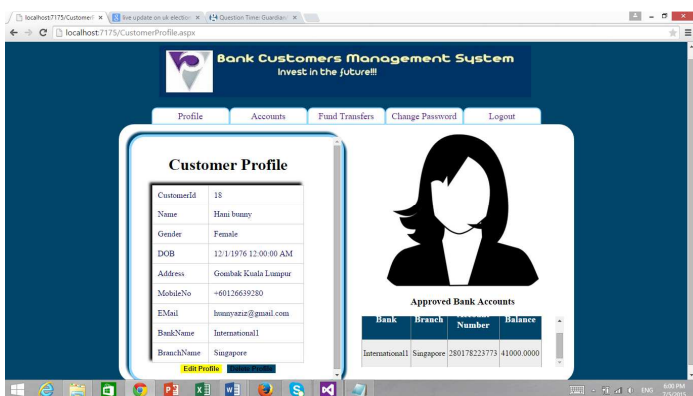
Fig 25 Customer Profile Page

Fig 28. Manager Profile Page
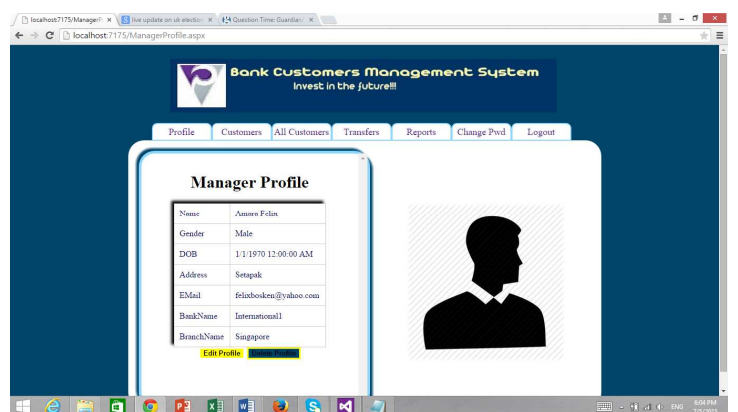
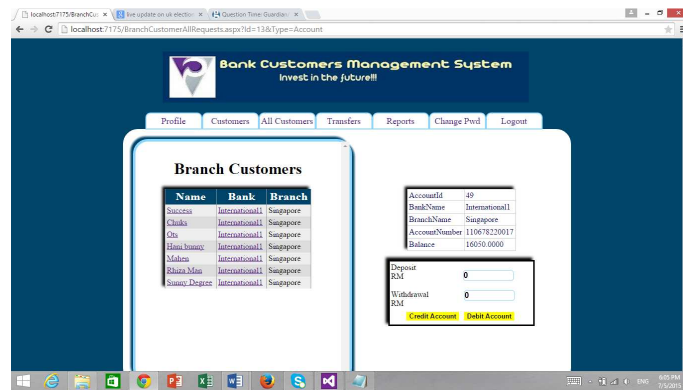supported me morally, I will forever remain grateful to all of you.

Fig 29. Manager Credit/Debit Customer Account Page

ACKNOWLEDGEMENT

I would like to express my gratitude and appreciation to all those who gave me the encouragement to complete this project. A special thanks to my supervisor Mr. Mahendran Ramasamy, whose help, stimulating suggestions and encouragement in supervising my project. Thank you for allowing me carryout this challenging task.

I would also like to acknowledge with much appreciation the crucial role of the Examiners Miss. Sina Ali, Miss Amira Majid and Mr.Hakimi who examined this project till this moment. I welcomed there suggestions and recommendations.

A special thanks goes to my brother. Chief Engr.Ken Ebubeogu, who supported me financially, technically and morally. Many thanks goes to the Head of School Madam Norashida and our final year Project Coordinator Madam Aziah for their approvals and signatures throughout this exercise. I am also extending my gratitude to my friends and well-wishers who